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# *Amanita chocoana*—a new species from Ecuador

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Abstract — *Amanita chocoana*, an interesting new species of section *Vaginatae*, is described from the Chocó region of Ecuador.

Key words — *Agaricales*, *Amanitaceae*, Estación Biológica Bilsa, neotropics

## Introduction

The Chocó, or Chocó/Darien/Western Ecuador, is a world "biodiversity hotspot" now covering only 24% of the original 260,000 km$^2$ forest (Myers et al. 2000). Extending throughout Colombia, Ecuador, Panama, and Peru, the Chocó has an exceptionally high concentration of endemic tree and animal species and urgently requires political support for conservation (Myers et al. 2000, Brooks et al. 2002, Sierra et al. 2002). To date, agarics have been reported mostly from the Colombian portion of the biome (e.g. Franco-Molano 1993, Guzmán et al. 2004, Franco-Molano et al. 2010).

The diversity of *Amanita* Pers. in tropical South America is not yet well known. Only two amanitas have been reported from Ecuador: *A. craseodermata* [sic; probably *A. craseoderma* Bas] and *A. fuscostriata* Pegler from the state of Cuyabeno, growing in a 'terra firme' forest in the Ecuadorian Amazon (Lunt & Hedger 1996). However, this genus is widely reported from neighboring countries such as Bolivia (Bas 1969), Andean Colombia (Tulloss et al. 1992, Tulloss & Franco-Molano 2008), Guyana (Simmons et al. 2002), and most recently Brazil (Wartchow & Maia 2007, Wartchow et al. 2007, 2009, Menolli et al. 2009a,b). We present here a new species of *Amanita* from Ecuador, collected within the Chocó biome.

## Materials & methods

### The collection site

The Bilsa Ecological Station (0°21′33″N 79°42′02″W, alt. 300–750 m) lies within the Chocó region in Esmeraldas Province on the northwest coast of Ecuador near the Mache-Chindul Ecological Reserve. The 3300 km² area comprises 80% mature forest and has an annual rainfall of 1500 to 2000 mm (Ortega-Andrade et al. 2010).

The vegetation on the collection site belongs to "coastal foothill evergreen forest" (Sierra 1999), "moist foothill forest" (Cañadas 1983), and "semi deciduous forest" (Holdrige 1967) that fit into the "Sector de la Cordillera Costera", a mountain range that lies east of the city of Esmeraldas, north of the Esmeraldas River (Sierra 1999).

Trees over 30 m tall are relatively abundant on the station and reach to the top (600–800 m alt.) of the coastal range in Esmeraldas and northern Manabí provinces. The Chocó separates the wet northern region from the dry southern coastal area. Characteristic flora includes *Caryodaphnopsis theobromifolia* (*Lauraceae*); *Carapa guianensis* (*Meliaceae*); *Matisia soegengii* (*Bombacaceae*); *Pourouma bicolor, Coussapoa villosa (Cecropiaceae); Perebea xanthochyma* (*Moraceae*); *Chamaedorea pinnatifrons, C. poeppigiana, Iriartea deltoidea* (*Arecaceae*); *Eschweilera rimbachii* (*Lecythidaceae*); and *Faramea occidentalis* (*Rubiaceae)* (Cerón et al. 1999).

### Abbreviations

For the biometric values, we follow Tulloss & Lindgren (2005), except that on editorial suggestion we changed the font originally proposed by Tulloss as follows: $\mathbf{w}_{cs}$ = breadth of central lamellar stratum; $\mathbf{w}_{st}$-**near** = distance from one side of central stratum to the nearest basidium base; $\mathbf{w}_{st}$-**far** = distance from one side of central stratum to most distant basidium base on the same side; L, (W) = range of average spore lengths (widths) in each examined basidioma; L', (W') = average of all spore lengths (widths) measured in all basidiomata; Q = length to width ratio per spore or range of such ratios for all spores measured; Q' = average Q value per specimen examined and the range of such averages; Qm = average Q value computed for all spores measured.

Herbarium codes follow Thiers (2011). Generic and infrageneric names and concepts follow Corner & Bas (1962) and Bas (1969), as modified by Yang (1997).

## Taxonomy

***Amanita chocoana*** Wartchow, **sp. nov.** FIGURES 1-4

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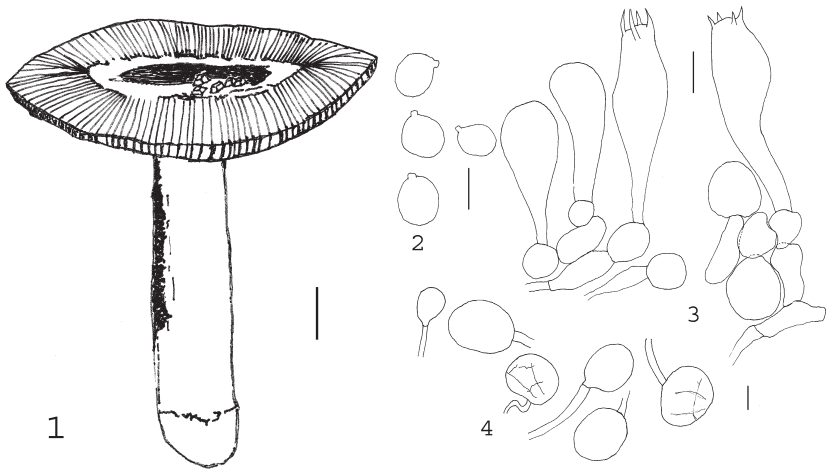
Differs from *Amanita colombiana* in the reddish brown pileus with pale margin, pyramidal velar remnants with yellowish tips, relatively stout stipe, and the subglobose to ellipsoid basidiospores.

TYPE: Ecuador, Prov. Esmeraldas, Mun. Esmeraldas, Bilsa Biological Station, 23.xi.2005, J.P. Gamboa-Trujillo, L. Carrasco & D. Cabrera s.n. (**Holotype**, QAP 72474; **isotype**, URM 82094).

ETYMOLOGY: *chocoana*, referring to the Chocó biome, within which the new species was collected.

Basidiomata solitary, medium size, rather stout, fragile. PILEUS: ranging to 60 mm in diam., plano-convex, brown to dark reddish brown at centre (between




Figs. 1–4. *Amanita chocoana*. 1. Basidioma (holotype). Scale bar = 10 mm. Figs. 2–4. (isotype) Scale bar = 10 µm.. 2. Basidiospores. 3. Basidium, basidioles, and subhymenium. 4. Universal veil from stipe base.

'cigar brown 16' and 'snuff brown 17'), paler in smooth zone outside disc, and paler ('clay buff 32') in grooved zone with white inter-striation at margin, glabrous and shiny at centre; margin broadly plicate-striate (>50% of ratio); context thin, probably white and unchanging; universal veil as scattered friable pyramidal warts whitish at first and then gray toward base with yellowish brown ('buff 52') tip, easily removed. Lamellae: probably free, sub crowded, relatively narrow, whitish, with concolorous edge; lamellulae rare. Stipe: ≤80 × 25 mm, tapering in upper portion cylindric in lower part, hollow, cream, fragile, smooth and glabrous; context white, unchanging; partial veil absent; universal veil as scattered brownish patches at base difficult to distinguish under strong lens (×10) in exsiccatum. Odor and taste not recorded.

Basidiospores: [90/2/1] (8–)8.5–12(–12.5) × (6.5–)7.5–9.5(–11) µm, L = 10.2–10.8 µm, L' = 10.4 µm; W = 8.2 µm, W' = 8.2 µm; Q = (1.03–) 1.06–1.65 (–1.70); Q' = 1.22–1.32, Qm = 1.25, inamyloid, hyaline, colorless, subglobose to ellipsoid, infrequently elongate or globose, smooth, thin-walled, at least somewhat adaxially flattened, with rounded apex; apiculus rounded obtuse to subconic, small, sublateral to subapical; contents monoguttulate. Basidia: 30–44 × 11–13 µm, clavate, with 4 or sometimes 2 sterigmata ranging to 6 µm high; clampless. Subhymenium: rehydrating weakly; cellular, ≤10–25 µm thick 2(–3) layers, sometimes having very small inflated cells from which basidia arise e.g. 10 × 8.5 µm to 14 × 13 µm; $\mathbf{w_{st}}$**-near** = 8.5–15 µm; $\mathbf{w_{st}}$**-far** = ≤12–21 µm. Lamella trama: difficult to rehydrate in material, but obviously

bilateral; $\mathbf{w}_{cs}$ = ≤25 µm or 35 µm; abundant filamentous hyphae 3–9 µm wide gradually diverging from central stratum, apparently lacking inflated hyphae, unbranched or rarely branched; vascular hyphae absent. Marginal tissue of lamellae: difficult to observe, sterile; apparently two layered, yellowish brown, with the outer layer with some globose cells 10 µm in diam., colorless and very few yellowish brown cells approx. 27 × 20 µm and the internal layer consisting of filamentous hyphae 6 µm wide, parallel to lamella edge. Pileus context: moderately well rehydrated, thin; filamentous hyphae 2.5–8 µm, plentiful, extensively interwoven forming a loose matrix in which other elements occur, commonly branched, septate, clampless; acrophysalides ≤50 × 25 µm, broadly clavate, relatively inconspicuous; vascular hyphae common, traversing the entire context thickness. Stipe context: difficult to rehydrate, but distinctly acrophysalidic; acrophysalides ≤125–187 × 23–32 µm, plentiful, clavate to slender clavate, thin-walled; filamentous hyphae 2–13 µm, longitudinally oriented, rarely branched; vascular hyphae 5–8 µm wide, unbranched, with longitudinal orientation, fairly common. Pileipellis: ≤200 µm thick; suprapellis with hyphae 1.5–5 µm, more or less erect, colorless, thin-walled, immersed in a strong gelatinized matrix; subpellis with hyphae 2.3–7 µm, brown to dark brown, radially oriented; vascular hyphae frequent 7–10 µm, sometimes anticlinal orientation crossing all pileipellis, somewhat arising from pileus context. Universal veil: On pileus—mostly absent in exsiccatum, with at least one dark brown thick-walled geometrically globose cell ≤40 µm. On stipe base—common filamentous hyphae 3–10 µm, densely interwoven, thick-walled, plentiful; terminal globose to pyriform cells with 25–50 × 17–37 µm, grayish to yellowish brown to somewhat brownish, with brownish thick-walled. Partial veil: absent.

Habitat: On soil among members of putatively ectomycorrhizal trees families with the most diverse families being *Leguminosae*, *Myrtaceae*, *Euphorbiaceae*, *Sapotaceae*, *Rubiaceae* and *Melastomataceae*. *Polygonaceae* and *Nyctaginaceae* (both probable neotropical ectomycorrhizal forest elements) have relatively small numbers of species (Gentry 1986).

Remarks: *Amanita chocoana* is characterized by its plicate-sulcate pileus margin, friable grayish pyramidal warts with yellowish buff tips that are pallid at first before becoming grayish brown and easily removed by handling, strongly gelatinized suprapellis, and variably shaped (globose to elongate) basidiospores. The new species belongs to small set of taxa of *Amanita* sect. *Vaginatae* characterized by a very friable universal veil largely disappearing from the stipe base and from which it is separated as follows:

*Amanita colombiana* Tulloss et al. from Andean Colombia shares the plicate-sulcate pileus margin topped by somewhat flattened pyramidal to conical velar remnants but differs in the initially fulvous remnants that darken

to dark reddish brown or fuscous brown and the dull olive brownish pileus. Its subhymenium, which is "subcellular ramified, on which basidia arise from short branched uninflated to slightly inflated hyphal segments" (Tulloss et al. 1992), contrasts with the somewhat common inflated to sub-inflated subhymenium elements in our new species. In addition, the *A. colombiana* basidiospores fall exclusively into Bas's globose to subglobose categories [106/4/3: (9–)10–12.2 (–14.2) × (8.5–)9.5–12(–14) µm, L = 10.8–11.5 µm, L' = 11.3 µm; W = 10.5–11.1 µm, W' = 10.9 µm; Q = 1.00–1.07(–1.17); Q' = 1.03–1.04, Qm = 1.03; Bas 1969]. *Amanita columbiana* is further separated by its probable host, *Quercus* (Tulloss et al. 1992) in the *Fagaceae*, which does not occur in the Chocó (Gentry 1986, Galeano et al. 1998, Cárdenas-López 2003). Colombia is the southern limit for *Quercus*-associated amanitas (Tulloss 2005).

*Amanita cinctipes* Corner & Bas from Malaya and Singapore resembles *A. chocoana* in having erect, ≤25 mm high pyramidal warts but differs in its mouse-gray to pale grayish pileus and globose to subglobose basidiospores 8–11.1 × 7.8–10.1 µm, Q = 1.00–1.10, Qm = 1.05 (Corner & Bas 1962).

The European *A. ceciliae* (Berk. & Broome) Bas differs in the yellow-brown pileus that darkens to brown with dingy gray-white to blackish velar remnants in old specimens, a short striate margin, and globose to subglobose basidiospores 10.4–14.1 × 9.7–14 µm, Q = 1.00–1.10 (Breitenbach & Kränzlin 1995).

*Amanita sororcula* Tulloss et al. from Andean Colombia differs in its pileus with whitish to gray to tannish gray appressed patches and globose to subglobose basidiospores [160/6/4: (8.2–)9.7–12.8(–16.8) × (8–)8.8–12(–15.5) µm, L = 10.2–12.1 µm, L' = 11 µm, W = 9.3–11.5 µm, W' = 10.2 µm, Q = (1.00–) 1.01–1.16(–1.25), Q' = 1.05–1.10, Qm = 1.07, Tulloss et al. 1992].

*Amanita antillana* Dennis from Trinidad and Martinique also has a strongly gelatinized pileipellis and similar basidiospores [40/1/1: (8.4–)9.8–13.3(–14.3) × (7.1–)7.7–10.5(–11.9) µm, L' = 11.2 µm, W' = 9.1 µm; Q' = (1.08–)1.09–1.40(–1.42), Qm = 1.24], although the Q range suggests narrower basidiospores; *A. antillana,* however, differs in the olive brown pileus, pulverulent velar remnants with thin-walled inflated colorless cells, and pileipellis hyphae (Pegler 1983, Tulloss 1994).

*Amanita calopus* (Beeli) E.-J. Gilbert from Central Africa resembles *A. chocoana* in the brownish tinted pileus but differs in its more elongate spores (10–14 × 7–9 µm, L' = 11.7 µm, W' = 7.7 µm, Qm = 1.50), slender stipe, pinkish gray lanose-floccose pyramidal to floccose pileus patches, and pseudoparenchymatous subhymenium (Pegler & Shah-Smith 1997).

*Amanita conicogrisea* A.E. Wood from Australia is a confused species. Wood (1997) placed it in the section *Amanita*, but the lack of swollen base reported in the protologue and illustrated in Wood's figure strongly suggest that a reclassification to section *Vaginatae* may be needed. The very short

*A. conicogrisea* description suggests that it differs from *A. chocoana* in its dull cream to cream-gray pileus with concolorous conical warts, slightly striate pileus margin, and a fairly slender stipe with velar remnants appearing as "little fibrillose margin on upper portion" (Wood 1997). Microscopic details are not sufficiently informative for comparison; the *A. conicogrisea* basidiospores are more or less similar in size (9.9–11.7 × 7.2–8.7 µm, Qm = 1.34) to our new species, the inflated cells of the universal veil are 30–40 µm in diam., and the pigment (not noted) is probably absent.

*Amanita craseoderma* from North Brazil differs in its non-gelatinized pileipellis elements organized somewhat as terminal clavate cells, very small irregularly shaped dark gray-brown velar remnants on the pileus, cellular subhymenium, and globose to subglobose basidiospores (10/1/1: 7.5–9 × 7–8 µm, Q = 1.05–1.15, Qm = 1.10; Bas 1978). *Amanita craseoderma* sensu Pegler (1983) from Martinique was reported with longer narrower spores (8.5–12 × 7.5–8.8 µm, L' = 9.7 µm, W' = 8 µm, Q' = 1.20) than Bas (1978); the similarity of Pegler's L', W', and Q' values suggests a relationship between his material and *A. chocoana,* but the Martinique material does differ in the small verrucose velar remnants and slender stipe.

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